

CLAIMS

We claim:

1. A process for substantially eliminating the occurrence of surface aberrations during extrusion of a thermoplastic polymer, comprising:
 - 5 (a) providing a thermoplastic polymer resin that has been treated by the application of heat in an atmosphere sufficient to substantially eliminate the tendency to create surface aberrations during extrusion of the resin; and
 - (b) extruding the treated thermoplastic polymer resin through a die wherein the extrusion conditions are such that the process would otherwise produce surface aberrations, thereby producing an extruded thermoplastic polymer product in which surface aberrations are substantially eliminated;
wherein the thermoplastic polymer resin and the resulting extruded
15 thermoplastic polymer are substantially free of processing aid.
2. The process of Claim 1 wherein the thermoplastic polymer resin comprises a linear low density polyethylene.
3. The process of Claim 2 wherein the thermoplastic polymer resin comprises a solution phase linear low density polyethylene.
- 20 4. The process of Claim 1 wherein the treated thermoplastic polymer resin is substantially in the form of resin pellets.
5. The process of Claim 1 wherein step (b) is performed using a blown film extrusion process.
- 25 6. The process of Claim 1 wherein step (b) is performed using a cast film extrusion process.

7. The process of Claim 1 wherein the thermoplastic polymer resin has been treated by the application of heat in an atmosphere to remove low molecular weight components.
- 5 8. The process of Claim 7 wherein the thermoplastic polymer resin has been treated by the application of heat in an atmosphere to remove substantially all low molecular weight components.
9. The process of Claim 7 wherein the thermoplastic polymer resin has been treated by the application of heat in an atmosphere to remove low molecular weight compounds to a degree sufficient to substantially eliminate microcellular foaming.
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10. The process of Claim 1 wherein the thermoplastic polymer resin has been treated by heating at a temperature of at least about 130°F (about 54.4°C) for at least about 4 hours.
- 15 11. The process of Claim 1 wherein the thermoplastic polymer resin has been treated by heating at a temperature of about 140°F (about 60°C) to about 160°F (about 71.1°C) for about 4 hours to about 60 hours.
12. The process of Claim 1 wherein the thermoplastic polymer resin has been treated by heating to a temperature less than the melting point of the thermoplastic polymer resin.
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13. The process of Claim 1 wherein the provided thermoplastic polymer resin has been treated within a vented extrusion apparatus prior to extrusion through the die.
14. The process of Claim 1 wherein the treated thermoplastic polymer resin is extruded using an extrusion apparatus such that during extrusion, low
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molecular weight compounds are removed from the resin prior to the resin exiting the die.

15. The process of Claim 1 further comprising heating the thermoplastic polymer resin in an atmosphere sufficient to substantially eliminate the tendency to create surface aberrations.
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16. The process of Claim 15 wherein the atmosphere is an at least partial vacuum.
17. The process of Claim 1 further comprising mixing the treated thermoplastic polymer resin prior to exit of the resin from the die.
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18. The process of Claim 17 wherein the resin is mixed using an inline static mixer.
19. The process of Claim 17 wherein the thermoplastic polymer resin comprises low viscosity compounds and the concentration of the low viscosity compounds is substantially uniform throughout the thermoplastic polymer resin prior to exit of the resin from the die.
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20. A thermoplastic polymer film produced by the process of Claim 1.
21. The thermoplastic polymer film of Claim 20 wherein the film comprises a linear low density polyethylene.
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22. The thermoplastic polymer film of Claim 20 wherein the film is a multi-layer thermoplastic polymer film.
23. A process for substantially eliminating surface aberrations during extrusion of a thermoplastic polymer, comprising extruding the thermoplastic polymer
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through a die wherein the thermoplastic polymer is substantially free of low molecular weight compounds and processing aid.

24. The process of Claim 23 wherein the thermoplastic polymer resin comprises a linear low density polyethylene.
- 5 25. The process of Claim 24 wherein the thermoplastic polymer resin comprises a solution phase linear low density polyethylene.
26. The process of Claim 23 wherein the thermoplastic polymer resin is substantially in the form of resin pellets.
27. A thermoplastic polymer film produced by the process of Claim 23.
- 10 28. The thermoplastic polymer film of Claim 27 wherein the film comprises a polymer selected from the group consisting of polyethylene, linear low density polyethylene, and combinations thereof.
29. The thermoplastic polymer film of Claim 27 wherein the film is a multi-layer film.
- 15 30. A process for producing a thermoplastic film, comprising:
 - (a) polymerizing ethylene to produce linear low density polyethylene;
 - (b) treating the linear low density polyethylene by the application of heat in an atmosphere for a time sufficient to substantially eliminate the tendency to create surface aberrations during extrusion of the linear low density polyethylene; and
 - 20 (c) extruding the product of step (b) through a die to produce a thermoplastic film under extrusion conditions such that the process would otherwise produce surface aberrations;
- wherein the thermoplastic film is substantially free of processing aid.

31. The process of Claim 30 further comprising pelletizing the linear low density polyethylene prior to treating the linear low density polyethylene by the application of heat.
32. A low density polyethylene extrusion resin for blown film extrusion, comprising polyethylene that is substantially free of low molecular weight species and substantially free of processing aid.
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33. The low density polyethylene resin of Claim 32 wherein the resin is substantially free of a compound selected from the group consisting of ethylene, copolymerization monomer, polymers having carbon chains of less than about 12 carbon atoms in length, and water.
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34. The low density polyethylene resin of Claim 33 wherein the resin is substantially free of ethylene, copolymerization monomers, polymers having carbon chains of less than about 12 carbon atoms in length, and water.
35. The low density polyethylene resin of Claim 32 wherein the resin comprises linear low density polyethylene.
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36. A thermoplastic polymer resin wherein the resin has been treated by the application of heat in an atmosphere for a time sufficient to substantially eliminate the tendency to create surface aberrations during extrusion of the resin.
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37. The thermoplastic polymer resin of Claim 36 wherein the resin has been treated following a polymerization step whereby the polymer resin is formed.
38. The thermoplastic polymer resin of Claim 37 wherein the resin has been treated following a pelletization step whereby the polymer resin is formed into pellets.
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39. The thermoplastic polymer resin of Claim 36 in the form of pellets.
40. The thermoplastic polymer resin of Claim 36 wherein the thermoplastic polymer resin comprises linear low density polyethylene.
41. The thermoplastic polymer resin of Claim 36 wherein the application of heat
5 in an atmosphere has removed substantially all low molecular weight
compounds.
42. The thermoplastic polymer resin of Claim 36 wherein the resin is
substantially free of a compound selected from the group consisting of
ethylene, copolymerization monomer, polymers having carbon chains of less
10 than about 12 carbon atoms in length, and water.
43. The thermoplastic polymer resin of Claim 36 wherein the resin is
substantially free of processing aid.
44. The thermoplastic polymer resin of Claim 36 wherein the resin contains
concentrations of low molecular weight species such that film extruded from
15 said polymer will not have surface aberrations, as judged by the unaided eye,
when extruded through a tubular film die having a 0.055 inch (about 1.4 mm)
die gap at 400°F (about 204°C) and 12 lbs/hr/inch of die circumference
(about 2.14 kg/hr/cm of die circumference).
45. An extruded thermoplastic polymer film comprising a thermoplastic polymer
20 resin wherein the extruded thermoplastic polymer film is substantially free of
low molecular weight species, substantially free of surface aberrations, and
substantially free of processing aid.
46. A process for treating a thermoplastic polymer resin susceptible to surface
melt fracture comprising heating the thermoplastic polymer resin to

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substantially eliminate surface melt fracture upon subsequent extrusion under conditions which would otherwise produce surface melt fracture.

47. The process of Claim 46 wherein subsequent extrusion is through a tubular film die having a 0.055 inch (about 1.4 mm) die gap at 400°F (about 204°C) and a rate of 12 lbs/hr/inch of die circumference (about 2.14 kg/hr/cm of die circumference).
- 5 48. The process of Claim 46 wherein the thermoplastic polymer resin is heated to remove low molecular weight components.
- 10 49. The process of Claim 48 wherein the thermoplastic polymer resin is heated to a temperature less than the melting point of the thermoplastic polymer resin.